To the knowledge of the inventors, the phantoms of anthropomorphic type realised so far are:

- the 2D or 3D brain phantom by Hoffman for use in nuclear medicine;
- an anthropomorphic phantom of torso for use in nuclear medicine;
- CIRS 3D brain phantom for localization for use in operations;
- Striatal Phantom for use in PET/SPECT by Alderson;
- CROBOT of torso for use in colonoscopy; and
- NEUROBOT, a brain phantom for localization for operations.

The phantom by Hoffman is a series of plastic discs which form a fillable chamber simulating the brain wherein the grey matter is completely filled with the solution containing the tracer, while the solid layers, reducing the volume which may be occupied by the solution, which simulate the behaviour of the white matter in nuclear medicine (with a ratio of 4:1 between the tracer concentration for the grey matter and the one for the white matter). The phantom does not itself represent a human brain, but it simulates its behaviour so that the images of nuclear medicine seem the ones of a real brain, instead the images of Magnetic Resonance or of CT do not appear so.

The CIRS 3D brain phantom is a cast of the scalp realised in a material which may be displayed on radiographic, CT and MRI images. The phantom simulates the bone of the cranium and the flesh surrounding it and it may be used for localization problems during surgical operations. The phantom is not multicompartmental, it cannot be used in nuclear medicine (MN) and its use is strictly limited to the application for which it has been realised.

The Striatal Phantom is anthropomorphic and multicompartmental, but the represented compartments are made of the caudate nuclei, the putamen and the rest of the brain, with no separation among white matter, grey matter and cerebrospinal fluid. It may be used in MN, CT and MRI but only for imaging the striatum.

The CROBOT phantom, still under prototyping, provides for the construction of a hollow human torso internally having a structure similar to the colon in order to be capable to simulate operations in colonoscopy, while the NEUROBOT phantom should represent a brain for leading a surgeon during certain operations.

Each one of the phantoms listed above is intended for a well specific application, that is for setting machines for a limited set of analytical methods often applied only to specific organs or tissues.

This limitation has enabled, from time to time, the avoidance of technical and practical problems, by selecting the most favourable technique of realisation to a specific case.

Consequently, no one of the single aforesaid phantoms may be suitable for setting all the PET, SPECT, MRI, MN, CT, CAT techniques or methods, simulating any type of tissue or even any set of tissues, and leading to an anthropomorphic representation of the concerned organs or tissues.

If any phantom among the ones listed above is taken, and it is used in another application, it does not work or it gives only approximate results not suitable for testing the analysing machines.

The aforesaid limitations actually come from the lack of an automated process which enables to pass from images of living beings to the effective production of the phantom and which comprises a processing which minimises the information of said images in order to save the production resources and hence to minimise the product cost, keeping in any case the universality of the produced phantom.

It is therefore an object of the present invention an automated process for generating three-dimensional maps of a multicompartmental and anthropomorphic phantom for use in researches which are conducted with different procedures, even multiple ones, by simulating any group of organic tissues.

It is still a specific object of the present invention a phantom which is produced starting from the maps which are obtained through the process according to the present invention.

It is therefore subject matter of this invention a process for preparing digital images for realising a biomorphic multicompartmental phantom, representing at least one organ and/or at least one system belonging to a living being, comprising a first phase A.1 of acquisition of images or "sequences" of the organ or of the system belonging to the living being, according to predefined acquisition parameters, forming a volumetric image defined by voxels, further comprising a phase A.2 of identification of tissues and/or tissue liquids and a phase B of selection of

CLAIMS

1. Process for preparing digital images for realising a biomorphic multicompartmental phantom, representing at least one organ and/or at least one system belonging to a living being, comprising a first phase A.1 of acquisition of images or "sequences" of the organ or of the system belonging to the living being, according to predefined acquisition parameters, forming a volumetric image defined by voxels, further comprising a phase A.2 of identification of tissues and/or tissue liquids and a phase B of selection of at least three of said tissues and/or tissue liquids, the process being characterised in that it comprises the following phases:

C.1 verifying the adjacency of the voxels, so that each tissue or tissue liquid defines a connected volume representing the tissue or tissue liquid itself;

C.3 preparing an image presenting the surfaces of the volumes defined in phase C.1 according to the following sub-phases:

C.3.2 determining a number of surfaces equal to the number of tissues, such that they result internal to one another, even if partially tangent, said surfaces being the convolution of the surfaces of one or more volumes defined in phase C.1, said surfaces giving, by addition or subtraction, all the surfaces corresponding to the tissues or tissue liquids selected in phase B;

C.3.3 assigning a thickness to said surfaces, so that in the portions wherein two or more surfaces are tangent to one another the thickness is assigned to only one surface, the set of said thicknesses forming a connected volume.

2. Process according to claim 1, characterised in that phase C.1 comprises the following sub-phases:

C.1.1 selecting a voxel from the set of voxels forming the whole acquired volume;

C.1.2 comparing the selected voxel with a neighbourhood of six voxels which are connected to it through one face;

C.1.3 if another voxel of the same type (belonging to the same tissue or tissue liquid) does exist in said neighbourhood, examining the neighbourhood of this one, and so on recursively;

C.1.4 if during phase C.1.3 an island of one or more connected voxels of the type selected in phase C.1.1 is identified, which is